

THIRD-PARTY LOGISTICS CREATING VALUE FOR A CUSTOMER

CT-Logistics Oy, Logistikas

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<p>Abstract</p> <p>This thesis is about making warehousing improvements in a third-party logistics company, Logistikas, premises in Säynätsalo. The purpose was to implement a new kind of shelving layout in the Säynätsalo warehouse in order to gain better accessibility. At first the manager level proposed to make a tool for the warehouse personnel to gain information on the optimized shelf locations for individual products. Later on, after studying the product profiles and the nature of the warehousing operations in different premises, the tool was formed to be more like a warehouse layout mapping that would include larger entities with a different customer goods range rather than just one individual product. In this case, the Säynätsalo facility holds the majority of Valtra's production line goods and the layout design is limited to the manufacturing product range.</p> <p>The aim of the thesis is divided into two parts. In the theory part, a quantitative study was used defining what third-party logistics is and what the business field consists of. The research emphasizes to question: what kind of value does third-party logistics provide for a customer and by what means. Some of the business publication, which provided numerical data collected globally and also a lot of valuable information that supported the answering to the thesis question. The problem solving in the company was mainly supported by the numerical data gained from the enterprise resource planning system provided. The major part of the decisions resulted from the professional opinions and requirements of the personnel.</p> <p>The warehousing layout created can be seen as an answer to the company's needs, and it will be taken into use. This layout model will also support other operations in Logistikas facilities and will be used together with the Logmaster ERP system. It is assumed that this layout will give financial benefits to the operations in terms of efficient usage of labour, but mainly it helps to arrange the shelving operations in a more systematic and rapidly accessible order, which will support the receiving and forwarding activities.</p>		
Keywords Third-party logistics, outsourcing, customer relationships, warehouse operations		
Miscellaneous Supply chain management, enterprise resource planning system (ERP)		

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Vocabulary/Terminology/Definitions

Benchmarking	<p>”A measurement of the quality of an organization’s policies, products, programs, strategies, etc., and their comparison with standard measurements, or similar measurements of its peers” (Business dictionary, 2013).</p> <p>Benchmarking can be used for determine what and where there is need for improvement. Also it is used analyze how and what means other organizations are doing to reach high performance and then analyzed information can be implemented to improve own performance. (Business dictionary, 2013.)</p>
Buffer Stock	<p>Buffer stock or other name by safety stock is defined as an inventory level that is reserved in stock in case for sudden demand change. A certain level of goods that will be enough to avoid stock-outs until the next stock fill.</p> <p>Regularly maintained buffer inventory requires demand forecasting, if buffer is poorly managed the stock level may result too many stock-outs or as too high inventory costs. (Definitions for bufferstock, 2013.)</p>
Distribution	<p>“involves the shipping of goods to warehouses, retail outlets, or final customer.” (Stevenson 2012, 13.)</p>
FI-FO	<p>First-In-First-Out (FI-FO) is one product organizing method in warehouse management where first incoming product is also first outgoing product. This method is popularly used especially perishable product industry to prevent expiring. (Logistics Glossary by DHL, 2013.)</p>
Holding costs	<p>“Cost to carry an item in inventory for length of time, usually a year.” (Stevenson 2012, 562.)</p>

Lead Time	“The time between ordering a good or service and receiving it.” (Stevenson 2012, 16)
Ordering costs	“Costs of ordering and receiving inventory” (Stevenson 2012, 562.)
Pull principle	Pull method is a demand-oriented method for production processes controlling. The basic principle is that as the production line flow is divided to different actuators every one of them requests replenishments upstream to previous actuator or some warehouse continuously according to demand. In other words this is a continuous loop with demand requests going upstream and goods going downstream within the production chain. (Logistics Glossary by DHL, 2013.)
Purchasing	“Purchasing has responsibility for procurement of materials, supplies, and equipment.” (Stevenson 2012, 13.)

1 THE AIM AND STRUCTURE OF THE THESIS

The aims of the thesis

The thesis presents some of the basic ideas and issues of supply chain through terminology and theory referring to warehouse services and third-party logistics provider services. The thesis project refers these theories to a real life situation inside the Logistikas warehouse near Jyväskylä, Finland. The research presents aspects of different literature sources related to warehousing and operational management such as logistics outsourcing and customer relationships.

Thesis emphasizes the question that includes two parts: What kind of value does third-party logistics provide for a customer and by what means? Therefore the aim of the thesis was also divided in to two parts. The first was to gain a broader and better understanding on what is behind the phenomenon of third-party logistics. This is observed using a theoretical background and the customer and third-party logistics aspects appearing in publications. From those aspects the appearance of the values in third-party logistics will become more visible. The second aim was the presentation of the thesis problem in a form of a case study describing the project set by the company Logistikas. The purpose of the case was to give a picture of how the operations have been improved in a warehouse premises and what impact these improvements have provided. This should also give the picture of how and by what means the improvements can be turned in to a value. Both of these aim aspects correlate with each other as well with the thesis question.

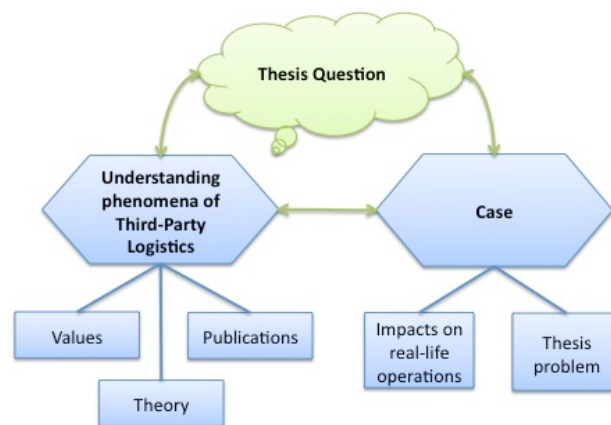


FIGURE 1. The conceptual process throughout the thesis report

Thesis Structure and Background

The thesis structure consists of four main parts: the company presentation, theory part, deeper focus on third-party logistics and finally the thesis problem case. The first chapter introduces the company that assigned this thesis and some details about the background of that company operations, history and business field. The next part is the theory basis for this thesis report discussing the basics of supply chain, operations and inventory management. The primary concepts observed inside are related to the topics of supply chain management, sourcing and third-party logistics. As presented in Figure 2 below, these three aspects are closely connected to each other. Supply chain management (SCM) can be seen as the upmost topic as it consists of the overall management and control of the whole supply chain and its parts individually. This topic is presented in the theory part only with the general details in order to give a solid base for understanding what all the theory is originally connected to. Sourcing is a branching topic from SCM as it presents the topics related to practices of seeking and evaluating potential suppliers. Sourcing also works as a link to third-party logistics (TPL) through outsourcing. Both outsourcing and TPL are in the main focus throughout the text therefore these issues are most relevant issues to observe and keep in mind in the practical part of the thesis.

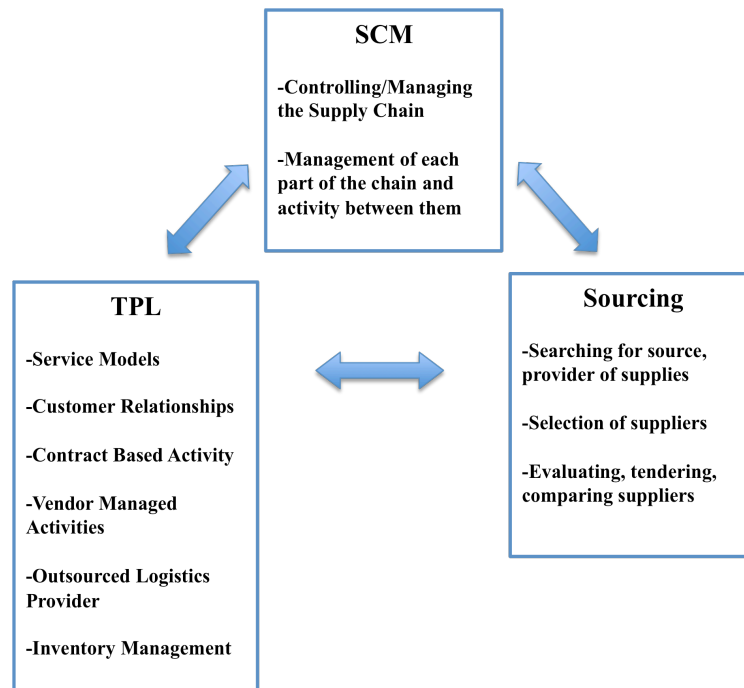


FIGURE 2. Thesis theory relation structure

The thesis problem case set by the company represents a third-party logistics business and therefore the theory also concentrates on the theory behind this business and market field. Before presenting the practical case of the report there is a deeper focus on third-party logistics. Chapter 5 gives a deeper knowledge of the potentials of third-party logistics operations, details of customer relationships, service types and models including some recent publications on how the business has survived in the markets in the past years. This chapter brings out some relevant details that strive to answer the thesis question of what value the third party logistics provides the customer and by what means. Finally the improvement project is the actual thesis problem that the company has set to be solved. This problem is brought in the text as a case that presents the real-life example of how the fluently working inventory management influences the daily operations and therefore this can also be seen as a value both for the third-party logistics company and customer.

2 LOGISTIKAS AND CUSTOMERS

2.1 Company Logistikas

Logistikas is a leading third party logistics provider operating in Finland. The company is a registered trademark owned by CT-Logistics and started its operations in Rauma in 1997 (present headquarters), and from that on, the company has expanded with logistics centres in Jyväskylä, Pori, Kankaanpää, Rauma and Hämeenlinna with a total warehouse space of over 120 000 m². Each facility is close by the customer or local businesses cooperating with Logistikas. (Logistikas presentation 2012.)

Logistikas has solid values that are present in every operation regardless the product range or customer. The company divides their business philosophy into four main elements:

- Transparency: flexibility, measurable development, open-minded and utilization of a win-win-situation
- Flexible and reliable information system: reliable ERP system for measurement, monitoring and reporting
- Right location: operational concentration in economically important areas and utilization of ports in Pori and Rauma
- Committed personnel: committed and competent personnel, innovative and customer-driven attitude.

As a third party logistics company (TPL), Logistikas provides basic services such as material handling, warehousing, project packaging, pre-assembly, labeling and transportation. In a broader view, they provide variable services depending on the customer for the manufacturing industry (e.g. supporting logistics for assembly lines), traditional warehousing for the trade and import business, value-added services for the energy industry and logistical support for the existing logistic chains. (Logistikas company presentation 2012.) Customer relationships are usually created by the initiative of a customer who is willing to purchase storage environment and handling services for their products. Logistikas and the customer set a contract and the preparation of facilities will be formed in the agreed terms of labour and warehouse layout.

The length of the contract is dependent on a customer whether the services are needed only for three months or then it can be an open-ended contract. Transportation between facilities is ordered from another forwarder or courier. If the end customer is near the Logistikas facilities the products can be picked up straight from the warehouse. However this is only possible if the contract allows resales from the warehouse point. Some of the premises are also located near Finland's coastline, where the customer products have a short transportation lead-time from warehouse to harbour.

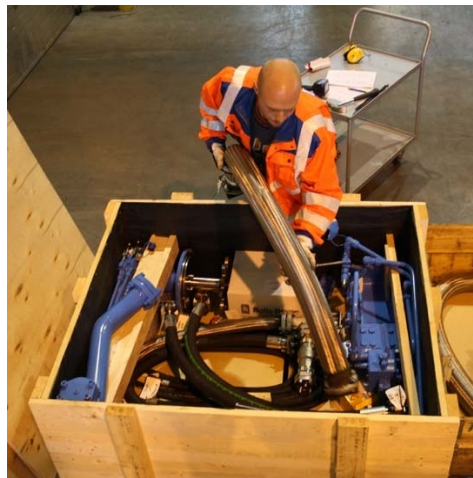


FIGURE 3. Order packaging

2.2 Customers

Valtra Oy Ab, the Finnish tractor and agricultural vehicle manufacturer operating in Suolahti Central Finland possesses the leading position in Northern Europe tractor business and is also the second most popular brand in South America. Valtra produces tractors to over 75 countries. All of the produced tractors are predetermined and customized individually piece by piece according to the end customer's or user's requirements. There is an example of Valtra's tractor models in the Figure 3. Valtra is part of Agco (Agricultural Corporation), which consists of a number of agricultural production companies' globally. (Valtra Website 2013.)

Agco is the third largest agricultural vehicle developer and manufacturer in the world, which provides globally known leading brands to over 140 countries with the help of over 9000 dealers.

The company emphasizes the technical diversities and global distribution network that support their leading position along with the widely known brands. In Finland Agco has a facility concentration in Southern Finland, Nokia, Linnavuori, where the Agco Power manufacturing plant produces engines with over 60 years' experience. (Agco History 2013.)



FIGURE 4. Valtra Tractor (Fits-for-every-farm, 2013)

2.3 Warehouses

Logistikas offers their warehouse space to a large range of products from ordinary consumer goods to heavy manufacturing goods. Every warehouse is adaptable to numerous different purposes. Despite Kankaanpää facility, which is much lower than the others, rest of the facilities have a large floor space and shelves with the ceiling height from 5 to 10 meters depending on the location. New shelves will be built in the case the customer needs it or other shelves are already reserved. Warehouses contain everything from bolts and nuts to partly assembled combine harvesters (see Figure 5 below). Logistikas provides picking service to any kind of product. Some goods are pre-assembled or pre-packed already when they arrive to stock but others need packing inside Logistikas premises before forwarding to the next location. Depending on the customer, a forwarding carrier is either arranged by the customer itself or Logistikas will arrange an outside carrier to transport goods inside and outside.



FIGURE 5. Warehouse facilities handling combine harvesters in Pori (Company presentation, 2012)

2.4 Diverse business models

Logistikas has a special pattern as a third party provider as it works parallel to the customer's supply chain (SC) rather than as a warehousing link in a series before/after some other link in customers SC (Logistikas company presentation, 2012). This is illustrated by the following figures below:

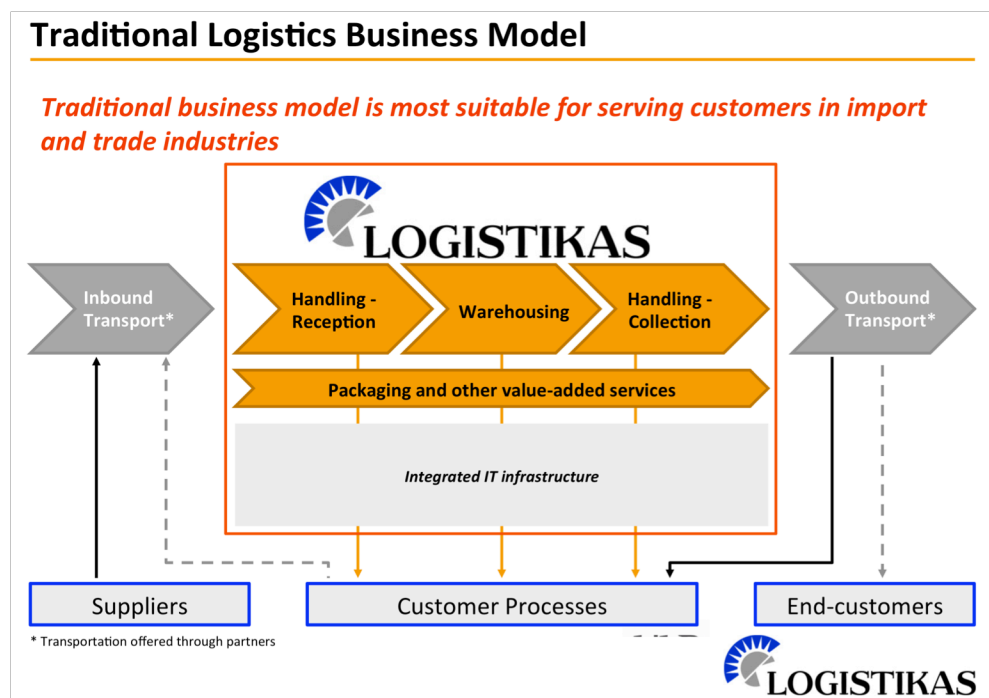


FIGURE 6. Traditional business model for logistics (Company presentation, 2012)

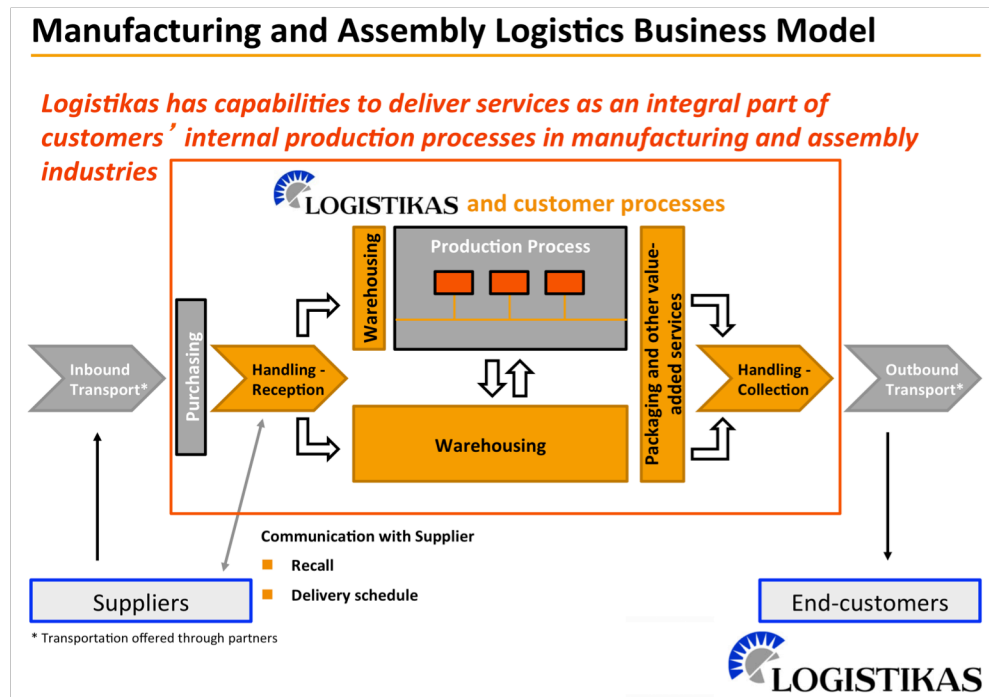


FIGURE 7. Logistikas company parallel business model (Company presentation 2012)

Logistikas Jyväskylä, Säynätsalo facility is a TPL service provider for local businesses such as Valtra Agco Tractor manufacturing company. As presented in Figure 7, Logistikas acts as a parallel warehouse for the customer company, in this case Säynätsalo stores and delivers goods straight to the manufacturing line. (Logistikas company presentation, 2012).

In addition, the Säynätsalo warehouse is a base inventory for Agco Parts foreign countries spare parts distribution. Agco sends foreign spare part order invoices to Logistikas and parts are sent to the Agco distribution centre in Suolahti, from where goods are then forwarded to the customer. Domestic distribution is managed straight from Säynätsalo warehouse transported by local forwarders.

In the following theory chapters, there are presented some of the key elements related to inventory, production and operation management. These tools and techniques are essentials to understand especially when observing the field of operational management of third-party logistics as well the thesis problem. The company Logistikas operates in the third-party logistics business area and the following theories have a great impact and effect on the working environment.

3 OPERATIONS MANAGEMENT ESSENTIALS

3.1 Theory part

Chapter 3 is the main chapter presenting the general theories for understanding the background of supply chain, operations and inventory management, which are essential parts of understanding the third-party logistics business model. In order to build a comprehensive understanding of the theory background and also to build links to the thesis problem, each theory paragraph includes a reference to literature and to the company Logistikas. Subchapters 3.2 and 3.3 deal more with operational management and overall supply chain management related theories and 3.4 to 3.9 are more inventory management oriented. Some of the issues, such as forecasting and measuring performance, can be seen as daily operations for some companies. The most relevant issues for each management type are presented in this chapter and there are a few more definitions in the vocabulary/terminology section on the first pages of this thesis. By reading through this theory chapter, the reader is also more capable of seeing the bigger picture in research procedure and able to follow the terminology.

3.2 Supply chain management basics

All the theory behind this thesis is based on the supply chain management and what is under that topic, such as sourcing and operations management. Inside operations management, come out the issues related to inventory management, but before that, must be defined that supply chain itself.

The book by Lysons and Farrington 'Purchasing and Supply Chain Management' presents three definitions according to Mentzer's article 'Defining supply chain management' in Journal of Business Logistics. These three types are direct, extended and ultimate supply chains. The first type includes a simple structure including supplier, organization and customer in either up-stream or down stream similarly to following two other types. The second, extended type consists of suppliers' supplier, supplier, organization, customer, customers' customer. (Lysons & Farrington 2006, 94.)

The third, an ultimate supply chain, is more comprehensive as there are also external links such as third-party logistics, financial provider and market research firm included. (Originated from Journal of Business Logistics, vol. 22, No. 2, 2001.) Figure 8 shows a flow chart example of such an ultimate supply chain. (Lysons & Farrington 2006, 94.) The company Logistikas is a part of an ultimate supply chain not in the ordinary as the figure 8 shows, but side by side with an organization or customer working in parallel before proceeding to another phase in the chain.

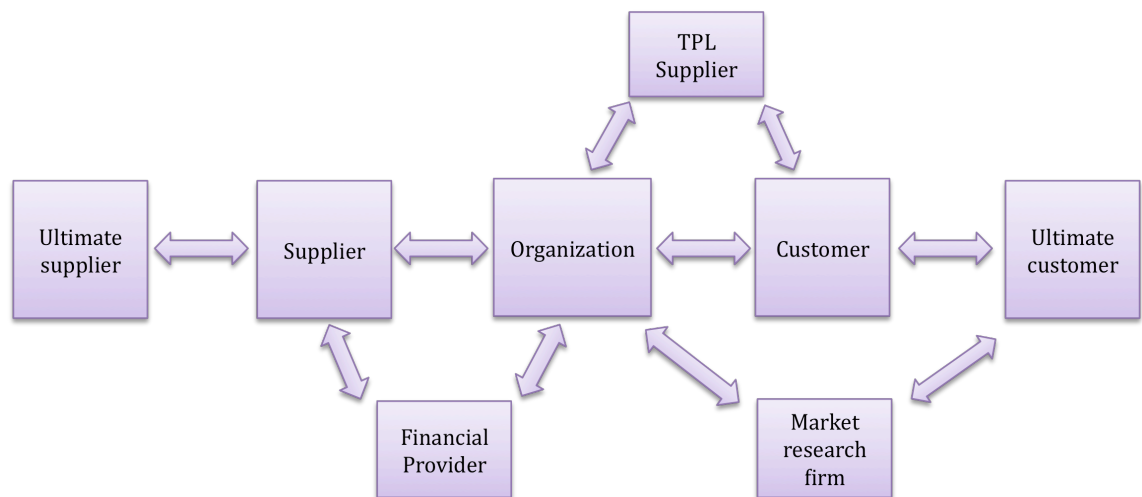


FIGURE 8. Ultimate supply chain process chart (Lysons & Farrington 2006, 94, edit.)

Supply chains can be further classified into efficient and responsible supply chains, where efficient supply chains concentrate on low operational costs focused product range with accurate forecasting whereas responsive supply chains target to rapid delivery cycle time and agility in the whole chain with high product variety and low forecast accuracy. (Lysons & Farrington 2006, 94.)

3.3 Sourcing to outsourcing in SC

In order to understand outsourcing and 3PL, it is important to present the basic concept of sourcing in the supply chain and some of the main details and processes that later drive to outsourcing activities. There are numerous ways of defining sourcing, different kind of literature and disciplines may have variable assessment of how to determine sourcing, and here is one step-by-step approach.

Sourcing is defined as a key process of procurement or purchasing process where suppliers are identified, selected and developed. Sourcing can be either tactical and operational or strategic. The difference between these two is that strategic sourcing is more concentrated on a deeper understanding of requirements and a broader understanding of a specific field, whereas tactical is more straightforward with clear and simple requirements and limited alternatives in provided designs or specifications. Tactical and operational sourcing takes place in low-level and short-term decisions concerning items of a high profit with a low criticality and low risk. On the contrary, strategic sourcing concentrates on long-term top-level decisions by aiming to a high profit including high risks in supplying strategic items. (Lysons & Farrington 2006, 367.)

According to Novack and Simco there are 11 stages in the strategic sourcing, the process that customers need to go through when searching a potential new supplier. First is to identify and discuss the customer needs and to define the user requirements for a sourcing target. The next step is to decide on whether to make or buy. (Lysons & Farrington 2006, 368.)

For example to make or buy decision, whether a firm is willing to make a product by itself, but for financial reasons, it is willing to have a part of the product is bought elsewhere or to make the whole product itself.

Next is identifying a purchase type. Generally there are three categories in purchase types varying in time consumption and complexity characteristics. First is a straight rebuy or routine purchase when the supplier or item is known and familiar from the past and the item follows simple routines that are cycled or repetitive. Further options are modified rebuy or new task. In modified rebuy, the product or item is known, demand is continuous but still in a need of slight flexibility. The product may have some modifications in a need of cost reductions, need of supplier change or seeking for better quality service. In new task, the sourcing situation is totally new and prerequisites for purchase type require closer look at the decision whether to choose make-or-buy or outsource. The product or specification is completely new and purchasing is random or seldom. These characteristics drive also to single or partnership sourcing. (Lysons & Farrington 2006, 368, 423–424.)

Once the purchase type is selected, the next step of sourcing leads to market analysis; this analysis indicates whether the suppliers is one of a kind or are there others like it in a smaller or larger scale.

After a list of possible suppliers is prepared each one of them is evaluated to see which of them can meet the demand and then the best alternative is sorted and then chosen. In the end, the cooperation starts and the performance will be measured and evaluated. Customer gains performance data from the supplier activities, which can be then used for further sourcing in future. (Lysons & Farrington 2006, 368.) See figure 9 for illustration of these 11 steps. This is only one of many methods how sourcing can be exercised.



FIGURE 9. 11-steps approach of sourcing process according to Novack and Simco (Lysons & Farrington 2006, 368.)

Through these 11 steps can be determined the necessary details that a company needs to go through in the search of a new or alternative supplier. The next issues approach to operations and inventory management. Some of the resources and tools that are presented play in important roles in both of the management types and are also present in Logistikas daily operations.

3.4 Measuring Performance

In order to establish and maintain a sustainable relationship between the customer and outsourced company, there needs to be metrics and tools to monitor operations and situations constantly. Outsourcing contracts usually include some key performance indicators (KPI) that work as goals metrics for the operations, and help to meet the customer requirements. As examples for financial aspect return on investment, in the sales aspect, the total value or sales per customer, in the process side, productivity, and from the supplier point of view the potential KPI would be total costs per piece. The level of performance metrics highly depends on the customer requirements, as they set the goals that need to be fulfilled by the outsourced company. (Rushton & Walker 2007, 336)

In the inventory aspect, KPIs can be lead times, rate of stock turns, stockouts, stock cover and service levels. The first of these is simply the time that it takes a number of products to go through inventory. The rate of stock turns means the number of occurrences that an item is sold and taken from inventory and then replaced with another in a given time period. This may be calculated the by number of sales or issues divided by average inventory at its selling price. The definition of a good number of stock turns varies depending on the product and markets.

Stockouts, on the other hand can be referred as KPI, for example, the less stockouts during a certain time period, the better performance. (Lysons & Farrington 2006, 324–325.) Usually contracts set a limit to minimal stockouts during a time period that is needed to be achieved. Yet there is the opposite of stock turn is the stock cover, meaning the number of days that one stock-keeping unit will last if the estimated rate of use stays the same. The estimating calculation is based on historic figures and it can be done to a daily metric by dividing rate of stock with 365 days in order to gain daily average aim. (Lysons & Farrington 2006, 325.)

These are mainly inventory-based metrics. For operations management purposes, some companies also use for example the number of finished goods delivered in time or the number of finished products per a certain time period. Metrics may be used as a tool for personnel motivation or financial monitoring but more importantly for

customer satisfaction fulfillment. KPI supports the good communication in customer relationships, which is a highly important value for the customer. A company may set goals to their operations, and performance metrics are good aid to reach the goals.

3.5 Forecasting

A sustainable and comprehensive inventory management may require broadly studied and detailed forecasts, especially when batch sizes vary, or more importantly, if the market region includes demand fluctuation due to seasonal products. Logistikas does not provide any forecasting data for the thesis purposes, and the company does not cooperate with present customers according any projected forecast. Only some of the products are sent in predetermined batches that have been known for quite a time before delivery, normally batches are sent only when ordered (as with a pull-principle). Still the definition of forecasting is an essential part of inventory and operations management, and therefore it is discussed here for deeper understanding.

The accuracy and cost of a forecast will depend on the requirements that have been set. The time range that is calculated may vary from three months to two years, according to whether it is a long-, medium- or short-term forecast. The forecast should be carefully based on the case dependent data. Forecasting has various, techniques such as qualitative and quantitative.

Qualitative forecasting is based on human opinions or expert statements that can be classified as pure hunches, or some other experienced information resource that may not be determined by quantitative techniques. Expert opinions are gathered from people that have the experience of the forecast target field such as company executives or outside consultants. This may lead also to wrong assumptions if forecasts are made blindly just relying on expert opinions. Qualitative technique may also include market-testing method. (Lysons 2006, 330) A new product is released to consumers and the sales are carefully followed in order to define which kind of appeal the product has to consumers. The forecasting comes out here in a way to see which kind of marketing and which product affects consumers. Making a market survey, where consumers can confirm if the test marketing was correct or not as extension.

The Delphi method is also one step-by-step qualitative approach, which starts by having conversation with the experts of their industry field. People are chosen from different fields but they do not know each other, this increases the spontaneous factor of their genuine feelings and expertise. The second step is to gather all statistical data of the forecasts according to the expert comments from the first step. If a common agreement for the forecast is created by all the participants, the process ends and the forecast is taken to action. If, however, the agreement is not created, the conversations with the experts continue until the common understanding is created to a single forecast. (Lysons 2006, 330–332.)

Quantitative technique relies on hard information that does not take human opinions into account and is based on numerical records and factors inside a certain time period. These factors include averages during some specific time period, trends that vary over time as well as seasonal influences with, for example, products that are weather dependent such as sport equipment. Also cyclical movement, like products that do not have a seasonal sales figure have influence on quantitative forecasting and random error, a factor that cannot be anticipated but still is taken under consideration. (Lysons 2006, 332.)

Another forecasting method that was used partially also in this thesis problem, is moving averages. This method is defined as gaining averages from recent actual values and an average that is updated as soon as new figures are available for calculating (Stevenson 2012, 84). Although this was used in the problem solving only for determining a number of each product sent forward from the warehouse during a certain time period, it can also be used to forecast future demand if updated regularly. (Stevenson 2012, 84.) Here is an example of a moving averages calculation:

Certain values are gathered from history data; during the last 5 months the individual values for each month are 45, 46, 48, 43 and 49 in the respective order to time. The moving average for forecasting the next month F_1 would be then calculated by having the monthly values divided by the number of the months:

$$F_1 = (45+46+48+43+49) / 5 = 46,2$$

After the month has passed and the actual value is revealed, then the actual value is used to the forecast next period F_2 . Let us assume that the actual value has been 40, and again the moving averages have been calculated based on the passed 5 months values:

$$F_2 = (46+48+43+49+40) / 5 = 45,2$$

This gives only a reflection to the few months passed, and the calculation is only an aid for near future forecast computing. With a bigger time range added to the computing could lead to a lag of the actual values, meaning that the average forecast does not follow the actual demand as steadily as it should. (Stevenson 2012, 85–86.) Another extension to this is called weighted moving averages, where the latest value is weighted to have 40% importance (marked in the formula as value multiplied with 0.4), the next latest values are weighted 30%, 20% and 10% in the same manner. This way the moving averages are calculated only for 4 time periods since the total weighting value must be 100%. Here is an example with the previous used values:

$$F_1 = 0.1(46)+0,2(48)+0,3(43)+0,4(49) = 46,7$$

Again this could be done in same manner as in the basic moving averages to have the latest actual value added to the formula in order to have again a forecast for the future period F_2 and weighting percentages move one step forward so that the 40% is on the latest value. This method is again concentrating only on the most recent values and weighting can be more or less random and therefore it may be used for only near future forecasting, but it is not suitable for long range forecasting. (Stevenson 2012, 86.)

These are simple models that can be used for inventory forecast purposes. The reason why they are presented here is that even this simple forecasts aid in general inventory management especially in the third-party logistics area. For the thesis purposes, there were no such forecasts or any provided that could be helpful for the thesis problem from customer products side. Therefore the presented averages in one of the Logmaster reports are gained with the moving averages model; only this time it was not used to determine a forecast but to justify the overall average of each item movement.

3.6 Vendor managed inventory

The Logistikas warehouse operations can be defined as vendor managed inventory (VMI) operations. Such term is used in inventory management meaning that someone or some company is monitoring an inventory and taking care of replenishment when needed. In other words, vendor is an inventory controller inside the supply chain, while other parts can concentrate on other issues not worrying about their stock levels at the same time. Also the responsibility for owning inventory is tranfered to a vendor. (Stevenson 2012, 681.) From the supplier's aspect, VMI can provide support for customer demand forecasts by sharing inventory information with the manufacturing line. A vendor works as a link between supplier and manufacturer (or other type of customer), therefore it is able to do flexible and adjustable operations in terms of production scheduling and item deliveries and quantities. From the supplier point of view, a vendor can control inventory more fluently and adjust the batch sizes, this makes the demand curve for the supplier smoother and gives flexibility to operations in general. On customer aspect, VMI provider reduced costs in inventory monitoring and in reordering to inventory costs. The overall inventory management costs and responsibilities are reduced due to the presence of a vendor.

On the down, side the vendor costs are tranferred to the supplier together with the inventory carrying costs. Having vendor managed inventory increases also the risks of misdelivery since customer deliveries are dependent on the manufacturer and/or distributor. Vendor management requires a large amount of detailed information about the cooperating customer products; this may result in problems for some companies to provide because of a high level of security or strong disclosure agreements. (Lysons & Farrington 2006, 259.)

Today's vendor-managed inventory implements enterprice resource planning systems to organize their operations inside inventory management. This is a powerful tool to connect different parts in the supply chain and it is used to share information between business partners inside the ERP network. ERP is also a basic tool used in the thesis problem for acquiring product history information.

3.7 ERP

Today's inventory management is more or less digitalized and requires several applications, programs and tools that help with organizing and handling a large amount of data. Because of bureaucracy, still a huge number of businesses are more oriented to using paper forms in their information change between the departments but still Enterprise Resource Planning systems is used in aside. Using emails has been and is still a conventional tool for informations sharing but in larger scale organizations there are ERP systems in common use. From the inventory management point of view, this is an essential tool for efficient record keeping, stock level monitoring and other inventory related information sharing between different participants in an organization. Adding ERP to the other important issues already handled gives a bigger picture of the overall control in operational and inventory management.

Many of the bigger organizations include multiple functions or departments such as accounting and finance department, marketing, human resources, production planning, purchasing, inventory management, distribution, sales and supply chain management. The organisational structure in this scale may include an enormous amount of information sharing between departments and a tool for that information sharing is an enterprise resource planning system (ERP). "Integration of financial, manufacturing, and human resources on a single computer system." (Stevenson, 2012, 530–531). In the manufacturing industry, ERP works as tool for production related information sharing, for production sheduling and planning, inventory management, product costing and distribution. In the same manner ERP works also for logistical services. (Stevenson, 2012, 536.) Logistikas uses a specific ERP system called Logmaster, which was used for gathering information for the thesis project and it is the system that Logistikas uses in its daily operations. Logmaster is presented later in the practical part of the thesis problem chapter.

3.7.1 Pros and Cons of ERP

An integrated ERP system provides more rapid inventory turnovers and therefore reduces inventory costs by 10-40%. Also customer service improves as inventory accuracy increases by making less physical observing of the goods, and in the production it means set-up times are dramatically reduced because of the rapid information flow along the production line. In addition, the manufacturing benefits from ERP with a higher quality by reducing reworking, and also the cash flow improves, as the financial focus is timely managed. The cons of having ERP may be indicated in the implementation phase where the organization may not adopt the use of the system so quickly. A new system in an organization, which needs training and implementing, can be a time taking and very expensive investment at the start. As a tool, ERP focuses on operational decisions, but it does not work as an analytical tool for e.g. forecasting purposes. (Lysons & Farrington 2006, 354–355.)

3.7.2 ERP II

A more evolved version of the standard ERP system is ERP II. The standard ERP concentrates on optimizing within an enterprise, the role of ERP II is optimizing across the whole supply chain cooperating with a number of business partners. ERP focuses on general applications within manufacturing and distribution in a closed network, while ERP II is networked with all the company segments/sectors and applications are designed specifically to meet individual industry sector needs. Web-based ERP II is able to connect with other business partner's ERP II systems if they are same manufacturer's programs. Therefore the information can be shared inside the whole supply chain network. (Lysons & Farrington 2006, 354.)

The present ERP systems are more or less hybrid forms of the traditional ERP and ERP II depending on the market field and need, but generally these systems include many networked actuators inside a closed organization network or global scale supplier network. Together with a ERP system, companies such as Logistikas use just-in-time principle in their fast moving product range, in other words, products leave from the warehouse just in time to reach to next the destination exactly when they are needed.

3.8 JIT Environment

Logistikas uses JIT as an operational principal for products. JIT is defined as completing customer order and requirements in right place, at the right time in the right condition and right quantity with minimal resource usage. This technique is used in production scheduling and inventory management. Companies working in a JIT environment aim to minimize all the additional costs, time delays quality defects of all kind that might slow the process of goods from production to the end-customer. On the other hand the process needs to be flexible in a way that variabe batch sizes are still available to supply. A proper working model of JIT is operated in a “pull”-production system (explained later in the text) and requires a master schedule for goods production agreed by all participants in the supply chain and good communication between the supplier and customer. Also reliable transportation and short distances to customer are advisable. Production standardization is highly respected and there can be no defects in the end product in order to provide an efficient JIT workflow. (Lysons & Farrington 2006, 340–342.)

Working with JIT brings certain benefits to the operations, such as low inventory and scrab costs. In a JIT environment, there is a possible scenario that there is no need for inventory since products have a strong schedule to move through, and because of that, items never get on a shelf before the next stage in the supply chain or end customer. JIT also minimizes the need of several suppliers, optimizes communication and receiving activities. (Lysons & Farrington 2006, 344.) JIT provides other minimizing factors in the reduction in production rework, inspections and parts related delays. As to the capital requirements, in a JIT environment there are reduced inventories for raw materials, ready-made products, parts or work-in-progress products. Everything is tightly scheduled so none of the products need to stay in stock at all or maybe only a moment because they are transported to the next stage almost straight away. (Lysons & Farrington 2006, 343–344.) On the downside, there are some of the major concerns in operating JIT environment. If product demand has some unsuspected variation, having no inventory or even safety stock because of JIT environment, this may lead to hard stockouts. Also if the production line has multiple suppliers and if one out of several suppliers fails to supply some part to the manufacturing line, the whole product delays. Therefore, the bigger the end product is, the bigger the risk for delay, especially if there is not any buffer stock. (Lysons & Farrington 2006, 344.)

3.9 Inventory ABC-analysis

As the name indicates this issue is closely related to inventory management. The ABC approach or ABC-analysis is a useful tool for measuring and calculating items importance, annual value and for controlling inventory according to value. There are three classifications in ABC-analysis: A products are very important items, B products have moderate an importance and C products have the lowest importance level. The typical classification may vary depending on the business sector and type. Usually A-products include 10 to 20% of the total number of items in inventory and 60 to 70% of the total annual inventory value. On the contrary as the value decreases to 10-20% and total number increases to 60-70% these items are C classified and B items are in between. The ABC calculation gives a big picture of all the products in inventory and the nature of each product for the use of, for example, optimized location in the inventory, shelving etc. C items individually may not be important or valuable, but this does not mean these might be unnecessary since they might include bulk material or other product range that will move in large batch sizes. (Stevenson 2012, 563–564.)

Even though the ABC-analysis is a vital tool for inventory management, for the thesis purpose this analysis type is not suitable. ABC-analysis does not take into account other factors than relation between value in dollars and quantity in stock annually. In the thesis case, these factors are ruled out from the money point of view while the concentration is only on quantities and inventory cycle times. Other factors like occurancies in supplying goods or sudden demand gaps or stock-outs must be taken into to account by the person making the analysis in a way that is seen fit depending on the situation. ABC-analysis works as a good tool for calculating cycle time, the physical number of products in stock. This helps managing the inventory records and seeing inventory activity. Calculations may be performed once or more often per year, the more times the more accuracy. In the thesis problem setting, ABC-analysis does not take presence as it is, but in the way of classifying items to different categories it is still done to achieve the information on the level of importance in each product. ABC-analysis may take place in future operations in other Logistikas faculties as a necessary tool, and therefore it was also relevant to be mentioned in this theory part.

4 THIRD-PARTY LOGISTICS

4.1 TPL in the present markets

Third-party logistics (3PL, TPL) is described as outsourced logistical activities. Companies often rely some or all of their logistical operations to some other company who has a better understanding of the business and better tools available for information systems, goods handling and transportation. Having an outsourced logistical co-operator will give an opportunity to concentrate better on their core business. (Stevenson, 2012, 688.)

Definition for outsourcing according to Stevenson: “Buying goods or services instead of producing or providing them in-house.” (Stevenson 2012, 31.) This is also a common thought that drives companies to select an outsourced cooperator in addition to various other reasons. Depending on the market sector, goods and products type or customer relations, many companies seek a third party logistics provider for several reasons. Some common reasons why someone turns to a 3PL provider are, for example, a more rapid distribution network to global markets avoiding any large-scale investments by creating a functional network from scratch. 3PL usually gives connections to a broad range of services and to other companies. Companies can expand to countries where they do not yet have any operations. For seasonal products, 3PL provides warehousing space for low seasons, and on the contrary, labour and transportation for high seasons. 3PL might have superiority in technology and equipment or possess higher experience in some field related to the customer’s own characteristics and therefore can offer those to the customer. Also 3PL could have large volumes in the means of transportation, which makes it more beneficial to have goods transported by 3PL rather than doing it by the customer itself. (5 Reasons to use a 3PL Provider, 2013.)

4.2 Good business relationship prerequisites

The relationship between the customer and 3PL partner has some prerequisites for functional cooperation: an integrated and standardized communication system to acquire an effective communication and also fast information flow in both directions. Another thing is supply chain visibility; all partners or operators in a supply chain need to have access to see the real-time whole picture of the product and money flow information. This is done usually with some specific ERP system that is implemented in the whole supply chain. In order to manage supplier delays or sudden lack of goods in inventory an event management system is required. It is a system that monitors certain issues in the system and notifies of any possible unwanted situations or events for example in inventory levels. It also suggests possible solutions to a situation where any unwanted event occurred and measures any actions performance in the supply chain. For performance measures there are certain metrics described for each location in the supply chain. For example, in the financial districts aren't simply cash flow can be used as a performance metric - in operations quality, the order fulfillment time to fill orders, in the supplier, field on-time deliveries, in inventory base turnovers and in customer point of view, customer satisfaction. (Stevenson 2012, 690.)

A study called "Eyefortransport 2006" concentrates on the question of ways in which to enhance logistics partnerships in outsourcing. Responders emphasized on enhancing overall communication at all organizational levels and establishing accurately defined requirements and procedures for all operations. These appeared to be the most popular ways to improve relationships and would definitely bring enhancement to strictly contract-driven environment, where relationships are bound to the small print of the contract with only one way operations model, and not having an open communication between the third party and customer. Enhancing the communication at all levels may result in breaking some of the existing communication links in order to gain a more comprehensive communication structure. (Rushton and Walker 2007, 254–255.)

4.3 Problematic Issues between user and 3PL

When the cooperation has been operational for some time between the customer and third-party service provider, there may arise some complications from the everyday operation, agreements and fulfilment of contracted details. From the user perspective, some usual problems generated in the cooperation are disappointments on agreed service levels, hidden costs, and insufficient service/product quality and operations management.

Eyefortransport 2006 survey presents more of the most difficult issues that lead to complications or are present right from the start. The most common of these is inefficient overall management on the TPL side, not acting according to the contract. This is usually identified to a situation where the people of 3PL representatives presenting the contract to the customer may not be the people who are actually operating the provided services. They give to the customer the wrong perspective of what they are actually getting from the agreement. Another usual issue that creates confusion is the difference in company cultures, the way people work in one environment does not always work in another company. Closely related to the insufficient management issue, this is one of the biggest obstacles that many companies run into. (Rushton & Walker 2007, 252-253.)

Hidden costs (also part of TLC calculations, read more in chapter 5.4) are another thing creating conflicts. The customer may not have been informed beforehand of all the possible costs that might occur and TPL may charge the customer for sudden or known extra charges even though these charges were not in agreements. Though it may not be fully TPL-providers' fault because logistics companies have to struggle in ever-evolving business and therefore it is hard, for example, to meet the demand requirements due to sudden seasonal demand increase. These things should be forecasted and carefully detailed before making agreements or agreements should be rearranged if needed. (Rushton & Walker 2007, 254.)

4.4 Recent perspectives on TPL

Now that some of the main characteristics have been presented this chapter concentrates on the influences, attitudes and opinions towards TPL in recent years and the state of third-party logistics from 2010 to 2012. The purpose is to create a larger view on the idea of how TPL has run during the past years and what have been the outcomes that users and non-users of TPL as well as third-party providers themselves have faced with the cooperation and what are the potential trends in the market field. The observation is based on Capgemini third-party logistics studies, from them can be seen opinion percentages on the global scale concentrating on some of the key issues that TPL business is good at, struggles or is developing for the future. Some key issues stand out from the texts that have the most impact and relevance to this thesis and therefore only those things are observed in this chapter.

Globally used TPL

International reports called 'The State of Logistics Outsourcing' written by John Langley Jr., Ph.D. from Capgemini consulting company publications 2010 and 2013, are comprehensive annual researches that provide statistics and questionnaires from logistics professional environment regarding 3PL markets. Results in both reports come from over 1100 responders (2010 report) and also over 2300 responders (2013 report), 3PL users, non-users and 3PL providers themselves.

The TPL study gives an aspect on shippers versus 3PL providers working in an economically unstable environment and on how the relationship has been improved and adapted. (Langley 2010, 7.) The gap between years 2010 and 2012 has shown an increasing use of third-party logistics. In year 2010, 65% of all shipper respondents (in this case meaning the customer who has acquired an outsourced service from TPL) reported of having an increasing use of 3PL and 89% of them have been satisfied with their cooperation. On the global scale, in year 2010 42% of respondents reported to have their logistics outsourced to a 3PL regionally as in Asia-Pacific 51%, Latin America 41%, and North America 35% and in Europe 49%. The respondents with increased use of outsourcing (from the total of 65%), were divided by continents with 65% in Europe, 57% in North America, 81% in Asia Pacific and 69% in Latin America. (Langley 2010, 8.)

Success Factors

Key factors to this successful collaboration usually appear in the form of good communication between partners and agile and flexible operational management. In addition the increasing IT capabilities have given 3PL a strong position with evolving expertise. IT knowledge is essential part in 3PL business since that is one element that customers seek from a 3PL. (Langley 2010, 4.)

Openness and transparency are seen as a value with high respect, since a good communication, sharing information, opinions and experiences, solves all the potential problems. Respondents also state that agility and flexibility help to face future demands more easily. Regardless of the operator, around 80 percent of shippers and 3PL providers in total agree on that 3PL providers' flexibility has been sufficient to meet the customer demand. (Langley 2010, 9.)

Another issue called gainshare has had some measurable benefits, which have been reported to have a significant impact within all regions around the world in cooperation with 3PL. In addition to mutual profit gaining on both sides, other benefits are logistics cost reduction, fixed asset cost reduction, inventory cost reduction, decrease in order cycle times, increase in order fill rates and increase of order accuracy. (Langley 2010, 9.)

The companies' outsourcing target fields vary regionally, but generally 3LP provided in year 2010 transportation services both domestically and internationally, warehousing and customs broker role and forwarding. Some of the less usual business appeared in the form of supply chain consultancy services, full order management, and fleet management or 4PL services. Still the transportation and warehousing has been the number one service model with 3PL during year 2010. (Langley 2010, 13.)

Full cost acknowledgement

An issue that the report indicates as a major concern is about total landing costs (TLC) calculation, including obvious and hidden costs. It is the sum of costs of all operations; including making and delivering a product to the final stage until the operations produce revenue. The calculation includes as much detailed cost information as possible. Some of the information may not be easily available and therefore some rely only on partial data.

If carefully managed, the calculations bring benefits to both the shipper and 3PL provider, such as aid to decision making on relevant costs in different supply chain sections. Cost insights give a better understanding of the costs background and take into account considerations, for example accurate tax payments. Insights also help to control inventory-carrying costs; if the lead times tend to delay, the accurate inventory cost can be determined simultaneously. (Langley 2010, 15–16.)

In profit margin aspect the TLC provides: More accurate price-setting and a better understanding of which product groups or items are driving the most margin as well as improved insight into the financial performance of customers, providers and other partners” (Langley 2010, 16). Yet TLC provides visibility to supply chain due to accurately calculated cost data. This brings financial, manufacturing and logistics sectors closer together. (Langley 2012, 16.) The most popular targets in TLC calculations vary by the opinion whether it is shipper or 3PL provider. In year 2010, the study showed that costs that were taken into 3PL providers TLC consideration were mostly transportation, product unit prices, tariffs and taxes, warehousing costs, sales revenues and margins, while these were the least desirable choices by the shipper. Factors like order-to-cash cycle and risk, quality and service related costs seemed to have a common opinion on the relevance to TLC from both sides, the most desired factor from the customer side was the financial impact of carbon footprint. The use of TLC calculations varies in companies but does not seem to have a stable part in daily operations.

Responders in the 2010 study divided into two groups, approximately 46% of the responders included TLC calculations to improve their business relationship and operations, and, on the other hand, 40% agreed with the advantages stated but still did not see enough effort to make one. The rest simply state that all the cost data is not available or it is too hard to get, yet knowing the potential in TLC calculations. (Langley 2010, 17.)

Expanding expertices

The overall use of outsourcing has not indicated any huge variation between reports 2010 and 2012. More than double the total number of 3PL users, non-users and 3PL provider responded to the study in 2012 and 65% of shipper responders reported using 3PL services, which is the same percentage as in 2010.

Around 12% of shipper revenues went to logistics and 39% out of that was concentrated in 3PL. (Langley 2012, 4.) In 2010 the same revenue figure spend was 11% and 42% were concentrated on outsourcing. Approximately half of year 2012 responders had been satisfied with the cooperation with 3PL. Outsourcing has resulted in cost savings in overall logistics, inventory and in logistics fixed cost assets. Like in the 2010 report, shippers emphasize the values of openness, transparency, fluent communication and also flexibility and agility in cooping with 3PL. In addition, IT know-how is growing to an even more important factor but companies also seek innovations from outsourcing. (Langley 2012, 4.)

“Until recently, 3PLs could demonstrate innovation by introducing process improvements, adding technology, improving execution, or offering new services. But shippers no longer see these truly innovative, instead seeking disruptive innovation: a new product or service idea that when implemented significantly disrupts a market and/or value chain by simplifying, automating, generating value, or reducing costs” (Langley 2012, 4).

From the technological point of view, shippers are willing to support those TPL investments that drive towards innovative evolving in the company aspect: increasing IT capabilities, mobile solutions, social media orientation, and big data and analytics. On organizational aspect the key elements are emphasizing on communication and collaboration and relationship governance. (Langley 2012, 4.) More specifically in organizational level the innovation can be found in CEO personnel, talent mostly brings also innovation and development for disruptive supply chain management. The disruptions can mean for example the difficult mixture of today's extended supply chains and at the same time shortened product life cycles, in addition to economic instability and price changes. More talented people in right position are more likely to survive such distortions. (Langley 2012, 5.) Another issue that shippers point out in both reports is gainsharing. In many occasions in some regions shippers seem to rely only on “fee-to-service”-type contracts where long-term contracts do not take place. Only about half of the shipper responders agree that operations provide gainshare but it could be more than that. (Langley 2012, 9.)

Non-users' aspect

On the other side of the coin there are the non-users of third-party logistics. The past years' economical instability has made non-users opinion vary but they do not believe in the reduction of cost in logistics or generally outsourcing to a TPL, even though the state of TPL has increased. In recent years, the non-user respondent percentages have been the same (around 19%) and with the same opinion that they do not believe in the actual benefits to be sufficient for their cause. This opinion stands the same in both reports.

In Figure 10 can be seen the summarized main issues that both studies together brought out. Knowing the recent aspects in the business field is important for the future and third-party logistics reports offer more or less benchmarking on the global scale of how business is doing at the moment, what the trends are, what is valuable or what is seen unnecessary.

Globally used TPL

- Around 2/3 of the shipper respondents uses TPL services globally
- Main focuses on transportation, warehousing, customs broker and forwarding

Success Factors

- Good communication, agility and flexibility, increased IT abilities, openness and transparency

Full cost acknowledgement

- The lack of clarity in Total Landing Costs has become a major concern

Expanding expertices

- Gainshare has become more desirable
- Shippers are eager to invest innovations in IT- and organizational levels

Non-users aspect

- Non-users justify their unwillingness for having TPL cooperation by insufficient benefits

FIGURE 10. Key points from Capgemini reports

4.5 Warehouse service

A service for by a 3PL is generally understood, as providing warehousing services.

The services offer storage space for customer goods and provide the surrounding activities. These activities can include receiving, putaway, storing, order picking, packing, shipping, loading and inventory counting. Everything comes with the cost, and therefore the customer is usually charged with labor, equipment, information systems, running cost, land and space costs. (Kivinen & Lukka, 2003, 26–28.)

Logistikas sets its position as a third-party logistics provider in the field of warehousing. The company works as a vendor managed inventory that has customers linked to an enterprise resource planning system with a shared information flow. On of the charging methods based on the rental shelving holding costs and packaging, and other in-house services are charged based on the working hours. Logistikas agrees on transportations between the warehouse and supplier/customer individually, but usually another TPL or forwarding agent handles the transportation. Services can be customized based on the customer's individual needs.

4.6 Evolving to 4PL

Another outsourcing model is called 4PL. This is an expansion of the traditional 3PL model, which includes more analytical groups or directions, such consulting services, rather than just logistics as a part of a supply chain. Fourth-party logistics is a broader version service model with more proactive approach towards a customer or shipper. The subject is observed here in order to gain a bigger picture of where 3PL can evolve or expand its services.

In a normal situation, a company or customer would make the operation strategy setting and planning, scheduling and tactical planning by itself and then leave the execution process to a third-party logistics provider. 4PL would take care of all these supply chain management layers all the way from both ends of the supply chain. In addition, 4PL would handle supply chain and business process engineering, IT service and –system coordination, financial planning, distribution management, procurement, customer support, order management and perhaps even human resource management or other administrative role/facility in the supply chain.

In addition, 4PL would provide essential and valuable R&D and analysis services such as optimizing the interaction between inventory and inventory. In a simplified way 4PL can be described as consisting of consultants handling business management on the strategical level, tactical planning and operational scheduling in the business level and logistics management in the 3PL level. As 4PL works as a consultant partner therefore it will also share the risks as well as the reward.

Value sharing and cooperation leads to a situation where both sides gain value but, on the other hand, both sides (customer and 4PL) also share risks in investments, operational costs and inventory losses. The overall risks may be higher in the use of 4PL than 3PL but it aims to higher margins profit margins than 3PL. The contract between customer and 4PL includes key performance indicators typical to certain industry depending on the situation (in the same manner as 3PL but to a larger extent). These metrics are, for example, material lead times, finished goods volume, order fulfillment lead times, on-time deliveries and complete order-to-cash cycle times. On the costs side, typical KPIs can be total logistical costs per unit or total management fees and margin. (Rushton & Walker 2006, 352–358.)

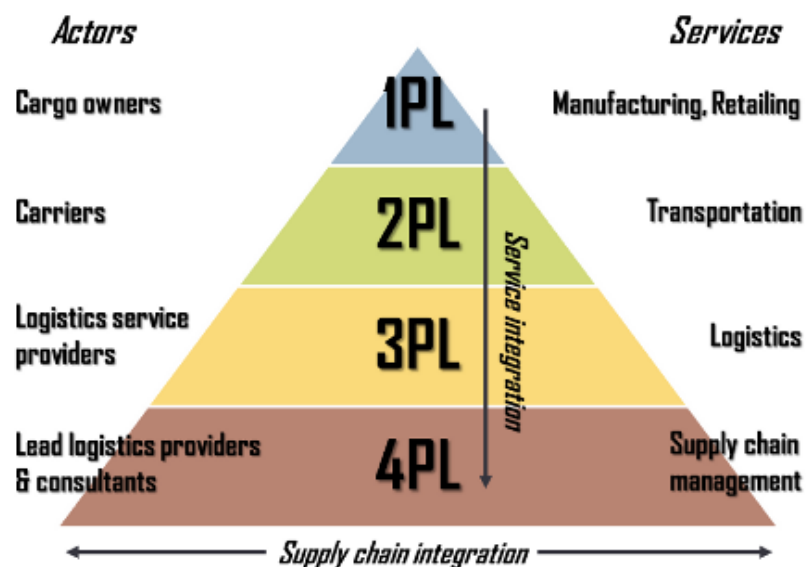


FIGURE 11. Logistics service integration levels (Norall, 2013)

In Figure 11 above there is yet a simplified definition of how the logistics integration levels are formed and expand towards the fourth-party logistics. The figure is based on Cerasis Logistical services provider websites where Steve Norall (VP. of business development) describes in his blog how the company defines 4PL.

It also includes the first- and second-party logistics, which basically means cargo owners and carriers. 3PL is the basic level of logistics, which includes outsourced contract-based services between shipper and carrier such as transportation and vendor managed inventory. 4PL, according to Council of SCM Professionals' Glossary, is formed as organisation joint venture to the customer or a long-term client. 4PL is a link between the customer and logistical operations such as transportation carrier, and in an ideal situation 4PL would control the whole customer's supply chain management. (Norall, 2013.)

5 PRACTICAL CASE: IMPROVING OPERATIONS

5.1 General

In this section are presented and observed the thesis specific details of the set thesis problem and procedures encountered during the process. Taking a look back at the research question “what kind of value and by what means does third-party logistics provide for a customer”, so far the theory part has taken a number of details to describe what the actual value is for the customer and also how the TPL users see the value in present day operations. In this part the final concrete example from Logistikas operations point of view is presented. The idea is to present the whole project procedure, different work phases individually and to see what has been made to improve in-house operations and how it is seen as a value to the customer and TPL provider itself.

In the Figure 12 are descriptions of what parts and how the research procedure has been formed. The process starts from company representatives giving their ideas of what they need and what should be considered during the project. From that on the stages proceed to studying the existing working environment and gaining information on the potential improvement issues. After that the study data had to be formed and the new layout started to form up. Through reviews of the company personnel and designing the new layout was produced including the data gaining, and in the end the implementation phase was finally reached.

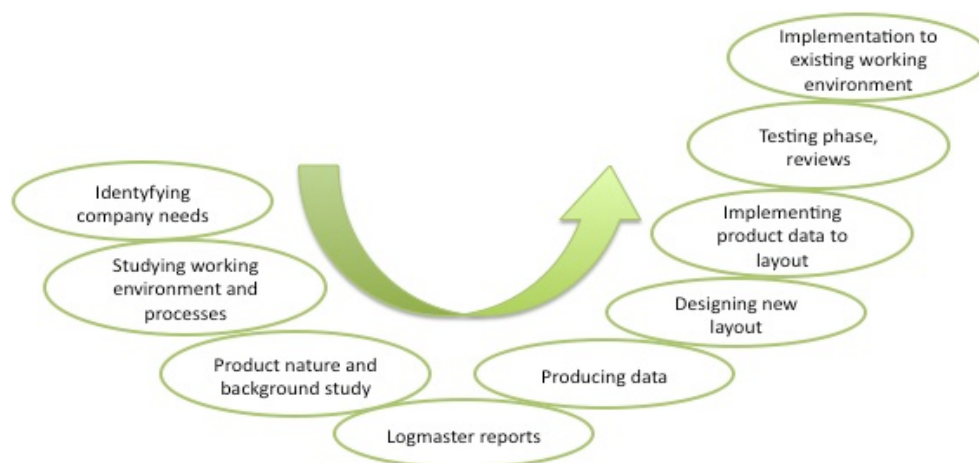


FIGURE 12. Process chart of the thesis problem solving phases

5.2 Thesis case background

The Säynätsalo warehouse goods handling mainly concentrates on Valtra production parts. Over 170 parts and item articles include all the essential parts for a fully manufactured tractor within the assembly line, in addition to all the spare parts available. Some of the goods are shelved and others are left on the floor, this is due the characteristics of the product. Some items may be so very large and heavy that they simply do not fit on a shelf, while some could be fast moving products for which they need to have a large floor space just for the inspection, and after a few hours the goods will continue straight to the manufacturing plant. Still, most of all the production goods will have a place on the shelf. Both shelved and unshelved products are after receiving inspections placed in a location where there is simply room for them. No product has a specific place for it on the floor or on a shelf where it is usually placed and stored for a longer period of time, no matter whether it is a fast moving product or not.

The new layout was formed as a tool for the use of identifying optimized locations for items according to their individual inventory flow-through rates. The layout was also tested practically in a small scale in order to find out the possible time benefits. The results are presented in the end of this chapter.

5.3 Case outlines and restraining factors

The boundaries for the research were set together with the company representative and thesis supervisors before gathering any information for the research. The primary target was to find a suitable solution for optimizing the workflow inside the Säynätsalo facility concentrating only on the Valtra manufacturing materials and goods. Still some specific items were ruled out because of their characteristics such as overweight, rareness, uniqueness, sample batches or other special reason. Specifically the aim was to improve the time usage between the receiving and picking activities, finding a better location for fast moving goods for more rapid shelving, picking and forwarding operations.

The information on the movement of the goods was based on Logmaster reports in the timeline from 1.11.2012 to 1.5.2013. The research did not take into account factors e.g. goods value. It is assumed that no product under observation exceeds the weight limits of a shelving slot where it is placed. The research does not include spare parts, tires, rims, counterweights or some other specific items defined. Filters were the exception to restrictions; even though they are spare parts their warehouse flowthrough time is considerably fast. The research took into account the item dimensions of a single product as a part itself or of a pallet that it has being placed on to, and the number of products per pallet and space consumed per pallet (1 pallet and 4 collars per pallet, 2 pallets and 2 collars per pallet, 3 pallets and 1 collar per pallet on top of each other, etc). For the research purposes, available space for the Valtra manufacturing goods was reserved from a specific area inside the warehouse and specific shelves inside the Säynätsalo warehouse. The theory basis in this research concentrated on general TPL characteristics that are closely related to Logistikas operations.

5.4 The tools available

The company gave access to an ERP application to gain information about individual product characteristics and various records. The Logmaster ERP system is integrated to the organization including every facility in the company and connecting to customer as well. This program was able to give every single detail of information needed for this thesis.

From theory point of view, a generally used tool for calculating items in inventory would be the ABC-analysis, but in this case this method was ruled out for a number of reasons, for example, because the Logmaster is able to give all the needed data from inventory rates to the total number of products on a specific time radius. ABC calculation is more interested in the value of the products, but in this case the product value was irrelevant. The ABC-analysis does not give any necessary data for the case for defining product importance or other relevance.

5.5 Inventory operation workflow

Here it was pictured in detail how the goods are managed in the warehouse, what are the special situations and how the forklifts operate with incoming and departing goods. These protocols or methods will not change but do gain some adjustments due to new layout when it is taken into action.

The normal workflow for an item or product entering the warehouse is quite straightforward. When trucks arrive, the goods are unloaded to the arriving goods zone on an open floor space. They are inspected and tagged with an information form on the side of the product, which indicates the part number that matches with manufacturing identification number. All the connected participants in the united ERP systems between the customer and Logistikas use this number for product identification. After inspection a forklift driver picks up the goods and places them on to shelves or floor spaces across the warehouse chosen by the forklift driver on the “where there is room, put it there”-basis.

Shelves have numbering order and once goods are placed on a shelf or floor space the shelving person marks manually the goods position on the shelf on to a form (for example shelf C, position 22-3, the first number meaning the column and latter number the shelf height) and the person is responsible for the location being marked correctly. Incorrect marking will cause later a manual search if the product is not in the recorded place. After completing the shelving, the person in charge will bring the paper form to a receivings box and from there all documents are collected by the the superior or secretary, who then marks the goods as inspected and received to the ERP system. This is a complete protocol for incoming goods.

For outgoing goods, the situation is more complicated. As mentioned earlier Logistikas provides project and product-packaging services, which includes all kinds of re-packaging or project packaging from palletizing to pouching of the products. A customer may need to have their incoming products in a different packaging material, for example different box for the means of further distribution or a special ready-made frame pallet for the manufacturing line. As an example of the latter case, the customers manufacturing line is designed so that for the main tractor frames there is a custom-made pallet construction where frames are re-palletized in Säynätsalo since

the original manufacturer pallet does not fit to the customer's manufacturing line. A pallet is switched so that a special ready-made pallet then fits to customer's production line. These are necessary actions according to the requirements of the customer. Such re-packed/re-palletized products are usually shipped at the same day and are not put back on a shelf. There is an example in Figure 13. Other smaller pieces usually leave the shelves in the very same pallets they are shelved with. Individual parts are pouched or boxed and then sent forward with a courier or with the other pallets to the next location.



FIGURE 13. Repalletizing frame construction for manufacturing-line-ready pallet

5.6 General Problems

The major problems and issues that drive to a change are spread to different locations of the warehouse. Since the facility is old, some physical problems have a strong effect on the in-house movement. Few locations restrain the full potential of the space usage only because they are too narrow places to operate efficiently.

Floors may have small holes that slow down forklift drivers, especially small electric forklifts, while driving to areas within a longer distance from the sending area. The rough floor slows down the driver as the forklift has weight on the forks. It would be possible to fix these points of the warehouse, but this time there is a possibility to ignore renovations since these issue points can be gone around. This is a factor that had to be considered in optimizing locations for fast moving items. Also having a lot of floor space used for storing makes larger transfers and even smaller transfers

pass through. At sometimes part of the goods have been placed inside the facilities on the floor space because there has not been available space on the shelves.

In addition, some of the shelves contain other customers' products as well; they need to be cleaned to another space in order to free space for targeted items. Since the shelving in receiving operations is made with a randomized order depending on the available slots on the shelf this consumes time in searching of the free space as well as in searching for a pallet for picking purposes. Although at the picking phase the location of a pallet is usually known, there is a chance that the person may have marked a wrong number in the shelving list, which then causes manual search for the product. A small possible human error, but still can cause extra time usage.

5.7 Logmaster

The company uses a computer based Finnish-made enterprise resource planning system called Logmaster, and all the necessary data for research purposes has been gathered from its database. The software is used to share billing information, inventory management, picking order and other logistical activities to share information between the customer and vendor. The system can communicate with customer ERP systems even if they have integrated a different ERP based system. Logmaster logs all the inventory and timeline data, and therefore can also print out history details on individual goods or customer related actions during a certain time period. For this research, the database is used to gather a single customers bill of material and these item inventory activities in a certain timeline and then used to define the movability of a single product and saldo rates to identify the actual need for shelving space.

5.8 Case procedure

The research started with gathering all available info on the manufacturing line goods by taking specific reports out of Logmaster's database related to goods that needed to be rearranged inside the warehouse. All reports were printed out and presented in Finnish and transferred to an Excel sheet, where the information was easier to handle

and edit. Tables 1 - 4 on the following pages, are not complete lists, they only serve illustrative purposes. The first reports were used for checking what parts the inventory has in stock under the name of customer production line. Report A included a list of every single manufacturing line goods (see Table 1).

The parts that were listed in the research boundaries as not included were filtered off. For goods that were chosen, were then compared to a second Logmaster report B, which indicates the number of all the events that a single product had had during the defined timeline (see Table 2). The number of events gives the information of popular and non-popular products, and therefore it was easy to identify highly moving goods that require more attention when planning the shelving locations. Report C gives the average number of goods saldos during the defined timeline and the number of goods per pallet (see Table 3). This is needed for the space calculations for how much one product takes space on the shelf on average.

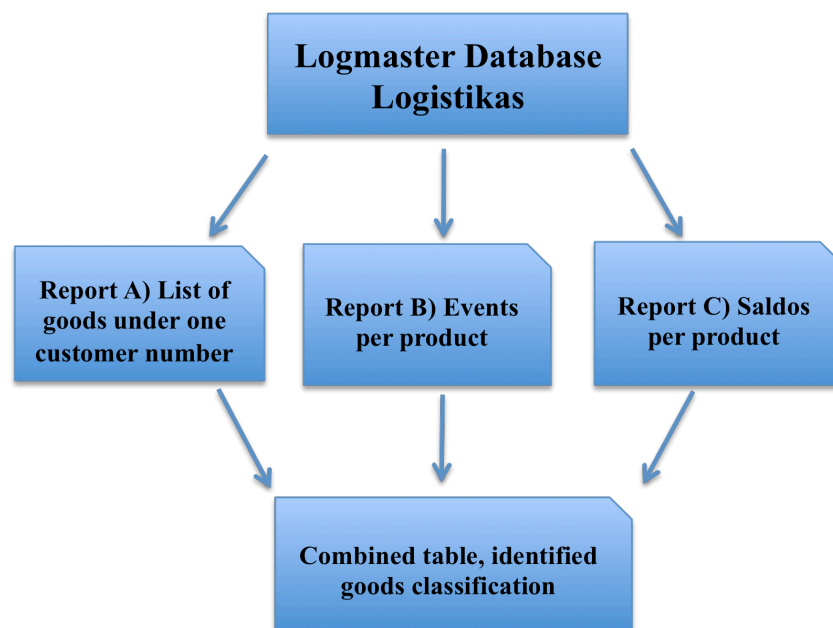


FIGURE 14. Research workflow with Logmaster reports and Excel

TABLE 1. Report A Part of a manufacturing goods list, a printout from Logmaster

	A	B	C	D	E	F	G
1				TUOTELUETTELO			
2							
3							
4							
5	Asiakas:	VALTRA OY AB / TUOTANTO					
6							
7							
8	Numero	Anumero	Nimi				Omistaja
9	34232910	34232910	40 KG ETUPAINO				11000
10							
11	63766900	63766900	VOIMANSIIRTO	540/100 EH, T274, H ID8			11000
12							
13	63766700	63766700	VOIMANSIIRTO	540/1000 MEK, T274, ID6			11000
14							
15	63766200	63766200	VOIMANSIIRTO	540/1000, T275, HEM ID11			11000
16							
17	63767000	63767000	VOIMANSIIRTO	540/540E EH, T274, ID9			11000
18							
19	63766800	63766800	VOIMANSIIRTO	540/540E MEK, T274, ID7			11000
20							
21	34138000	34138000	KUMIK/YR/	C-SARJA, T-SARJA			11000
22							
23	34541800	34541800	ALAVESILETKU	T-SARJA			11000
24							
25	34595500	34595500	YL/VESILETKU	T-SARJA			11000
26							
27	35059700	35059700	KUMIK/YR/	L/MMITYSLAITTEEN PUTKE			11000
28							
29	35181400	35181400	IMULETKU	PAINELMAKOMPRESSORI T-			11000
30							
31	36450500	36450500	VESILETKU	19 298 MUSTA EPDM-KUMI			11000

Generally the products have no seasonal demand and in this case the customer does not provide forecasts of any kind for their products and therefore it is not possible to define exactly how much space a product needs on the shelves. Relying on averages in this case was seen sufficient since the fluctuation is quite rare for major part of the whole product range. Only some single parts have proven to have peaks in inventory saldos. These are noted in report C; if a specific item has had fluctuation in defined timeline it is classified by another color coding, referring to the number of occurred high demand fluctuation events in the Excel sheet. Inventory saldo averages are simply counted by summing up each record of amount of received goods and the inventory level during that receiving time divided by the number of all recodings during the defined time period. This is the same method as using a moving averages calculation mentioned in the theory part (see chapter 3.5, Forecasting).

Average inventory of one article =

(Sum of item saldos after receiving / number of all receivings in defined timeline)

The last combined table is basically a comparison of reports B and C so that the numeric identification information from both the reports refers to same row (see Table 4). The whole table is organized in growing order referred to the number of events. As shown in Table 4 items that are colouring classification are set by the principle of product 'activity'. The active event colour classification has no mathematical

TABLE 4. Combined table from Logmaster reports with colour classifications

				Reilun saldoitiikin toistuvuus yli keskiarvon; väriluokitus		
				ei reilua piikkiä (alle muutaman lavan)		
				tapahtunut vain kerran rajatulla ajalla		
				2-4 kertaa rajatulta ajalta		
				5 tai useammin		
				Varimerkintä	Tapahtumien määraluokitus	
					300	50
					49	20
					19	1
Nimike	Tuotenimi	Tapahtumien lkm	Huomautus	Keskimäärä tuotteina	Keskimäärä lavoina	Saldohuippu rajatulta ajalta
34471930	ETUKAPPALE TLO	216		154.77	38.69	220.00
36344500	STEP OIKEA	150	Iso viimeisin erä	307.53	34.17	495.00
ACV0029530	CATALYZER SCR	148		81.00	13.50	132.00
63766200	VOIMANSIIRTO S	146	Massiivinen	139.75	279.50	154.00
37170310	VÄLIRUNKO SFS-	145	Massiivinen	166.50	83.25	214.00
63766100	VOIMANSIIRTO S	129	Massiivinen	130.13	260.25	146.00
37506110	INTERMEDIARY C	103	Massiivinen	161.76	80.88	276.00
33638570	ETUKAPPALE TLO	96		133.71	33.43	188.00
63029010	RADIATOR DENS	89		144.86	24.14	204.00
39609700	POHJALEVY PP V	81		504.00	84.00	504.00
63361800	EXHAUST PIPE O	78		142.33	15.81	216.00
37310710	ETUPAINOTELIN	76		281.60	35.20	320.00
36083130	ETUKAPPALE JO	70		84.80	21.20	100.00
63239700	AIR FILTER BOX	63		200.00	11.11	288.00
TB0901	FRONT PIECE SFS	61	Valurunko, massiivir	105.18	52.59	256.00
36095800	STAIRS VASEN	60		197.17	39.43	258.00
37150810	ENGINE BED SFS-	57		230.67	46.13	359.00
37762000	COOLING FAN BW	56		81.43	6.79	264.00
63361610	CATALYZER DOC	53		116.00	7.25	192.00
63361700	EXHAUST PIPE CO	50		120.37	5.02	184.00
39966910	WIND TUNNEL PP	47		468.00	78.00	558.00
831020	80 KG TAKAPYÖR	45	Painot	341.89	24.42	702.00
34232910	40 KG ETUPAINO	45	Painot	1345.29	48.05	2538.00
37466800	INTERCOOLER DI	41		72.88	6.63	99.00
34474410	ETUPAINOTELIN	40		126.00	21.00	144.00
37502900	INTERCOOLER DI	40		63.00	5.25	96.00
39354700	LOWER SUPPORT	38				
63814300	OIL COOLER DEN	38		62.53	5.21	120.00
35353810	KORVAKE TLO 30	36		212.14	9.64	374.00
35353910	KORVAKE TLO 30	36		233.54	10.62	308.00
63965200	OIL COOLER	36		63.27	5.27	84.00

The green classified products have almost everyday or at least weekly movement, and the yellow items have weekly movement or less. Products with red colour are rare and have moved only a few times during the defined timeline. Colour classified products are located so that most of the easy access shelves are primarily reserved for green and yellow products, and red products are located further away from most active zones. In practice, this means that green ones are closest to the entry point of a shelf on layers 1 and 2, layers 3 and 4 are for yellow products. Red products are then on the shelves that are left after using green and yellow ones first.

As an example, in Figure 15 there is a side picture of a shelf where the entry point means the shelf end and the entry side closest to sending area where the goods are then gathered. Green slots are fastest to collect since there is not a long way to travel horizontally and there is not too much of lifting the forks.

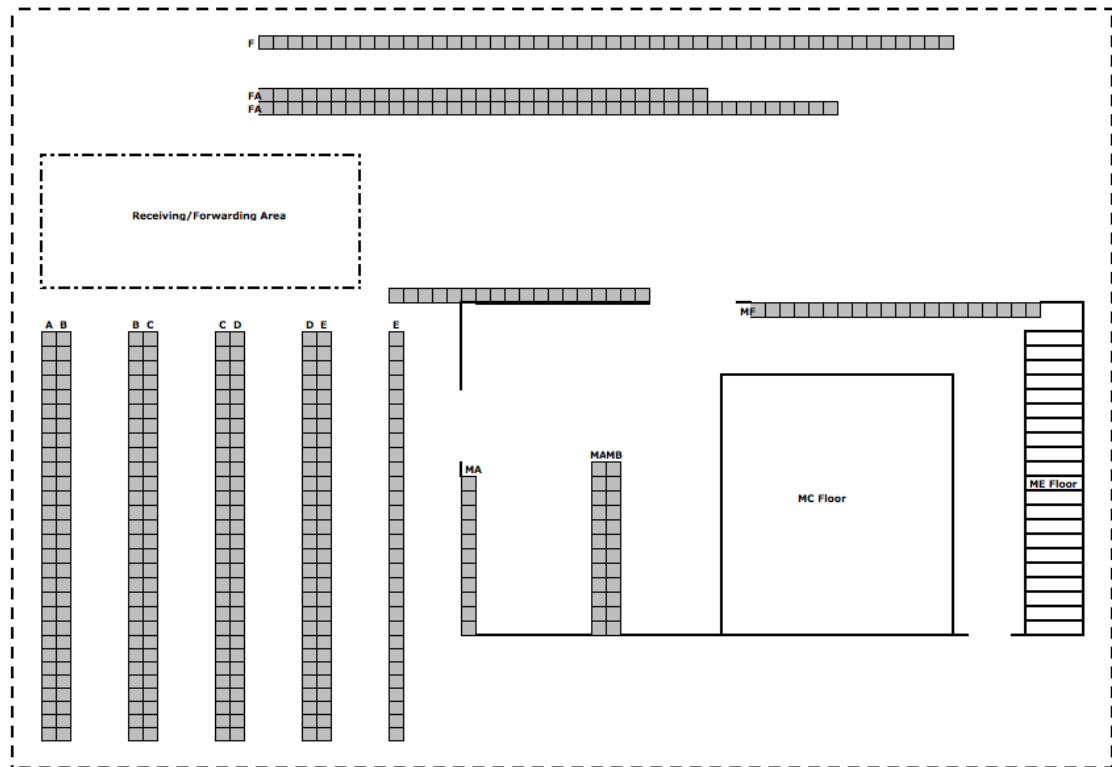


FIGURE 16. Rough sketch of the old warmhall section, the old layout

A few of the green and yellow products are characterized as ‘special cases’ such as front weights; they are located outside the facilities in a large warehouse tent since there is no reason to keep them on the shelves on the warm side. This kind of products cause a lot of empty space above them, where that space could be filled, for example, with two pallets with 2 collars on top of each other.

The new layout sets similar bigger and more massive products close to each other. Because of this, in the bigger batch sizes ordered it is much easier to pick all from the same area. Items that fit on one pallet supported with the maximum of 4 collars per pallet, or two pallets on top of each other supported maximum of two collars or three pallets with one collar each will fit in the new layout in the similar way as in the existing layout. Only the arrangement is changed when comparing to old layout and the new layout will concentrate the products on the colour-classified zones according to the table formed from the Logmaster reports.

In old layout, the shelving structure was clear but not completely fixed by the goods placement. Pallets were shelved where there was free space for them. This caused a lot

of extra time delays in both shelving and picking the products. The new layout needed to consider mostly the time usage and driving distance for the forklift driver. If there are specified zones where the shelving personnel knows beforehand where to put the goods after the receiving inspection and in same manner in picking the goods, the time for searching the space and driving distances will be shorter.

A new layout was designed to take those factors into account by having a fixed location colouring system where each product is defined by a different colour depending on the inventory flowthrough rate. Green products move daily or weekly, yellow ones weekly or less often, and red ones again less often than that. The accurate classification by the inventory flowthrough rates can be seen in Table 4 in the column “Tapahtumien määräluokitus”-table.

The purpose was to centralize the green and yellow classified products on the easy access zones; in this case those should be shelves B, C, D, E and maximum half of shelves F and FA in the ‘warm hall’ based on personnel’s opinion. Also the floor is covered with a smooth surface that causes less wear to the forklift equipment and is easier to drive especially with the load on the forks.

From all of green and yellow products, a few are very large, solid and heavy pieces that require a roof crane in the narrow end of the warm hall in order to repalletize them for production line purposes. Some of these can be stacked on top of each other and others cannot; they need to have place on the shelves. Those pieces that do have the option to be stacked on top of each other can be stored on the floor space. This is how it is done in old layout and how it is also in the new layout with a few locational exceptions.

The new layout improves collectability, increases shelves availability, and shelving operations will have more systematic structure. In the final layout can be seen the deviation of each shelf and the setting of each colour classification per shelf. Locations are designed so that each colour has enough calculated capacity based on the information of the combined table with all Logmaster reports. In addition, having an equal distance from one focal point to each shelf optimises the driving distance. Therefore the last green floor location on each shelf is as near the focal point as on the shelf next to the previous one. The yellow locations are set above the green levels so

that the most popular products are within a minimum possible distance horizontally from the focal point (the receiving/forwarding area) and then secondary parts (yellow parts) are above the green ones. This gives the yellow ones also the minimum driving distance but also adds the time to lift the forks vertically. The rest of the production goods, the red classified are then on the same shelves but after the yellow and green products (see Appendices “New Layout level view ” and “New Layout top view” to see the picture of classification deviation).

This arrangement occurs only on shelves A-F and FA, from the top view can be seen also shelves MA, MB, MC, MD, ME, MF and two unnamed shelf constructions (“New” is just built already in use and “Possible” are planned). MF and “New” are marked for heavy machinery products that are classified with green. The intention was to have them reserved only for the heavy parts, because there is a crane near the shelves that is used to re-palletize heavy products. The blank spaces MC and ME are used for products that cannot be shelved and therefore are placed in lines on the floor. In addition, this hall works as a spare space for incoming large shipments. The “Possible” shelves are marked in the layout because of the potential space for some new shelves if needed. The MA and MB are then for those products that had been moved once or only few times in the calculated timeline.

This is now the final warehouse layout model that is taken into use as a guide to a more optimized inventory management around a specified product range and in a defined environment. The actual layout map can be seen in the appendix section from top view and partly on the side view for illustrative purposes. With it the personnel is now able to operate with the shelving for each product and place products to clearly defined location where later they are easier to pick. This helps especially managing large shipments where volumes are greater and total driving distances are long. As the products have more centralized locations, the forklift driver has more linear movement inside the facilities rather than random and yet another additional benefit is also that the warm hall will have more shelf availability for larger volumes since all the unnecessary storing goods are transferred to another locations further back of the facility.

Testing the layout

The actual efficiency was also practically tested with a forklift that represents the average performance compared to the other forklifts inside the facilities. The test was performed by having two different types of order picking runs with the forklift, measured from the same focal point (focal point is in the receiving/forwarding area) each time and lifting the forks to the second level in each period. The first run included 7 evenly scattered picking locations, one in the middle of each shelves. The second run was done to 7 picking locations to the half way of each green/yellow zone according to the new layout mapping. This test resulted with the first run in the average time around 8 minutes, where in the second run the time was 6,5 minutes. This means in a normal 20 order picking list 3,5 minutes of time savings. This kind of 20-product orders are done mainly 4 times a day and therefore around 14 minutes are saved per day with the new layout. The normal daily operations suggest that the number of the periods receiving goods are theoretically the same as the sending of the goods. Therefore the same amount of goods are coming inside the warehouse, and theoretically the same amount of time is saved in shelving operations with the total of 28 minutes a day (this means that in overall this amount of time is saved for further duties). It is assumed that in a year there are 250 working days, each day there are 4 orders with 20 products each. With 14 minutes of time savings (around 0,25 hours) in both shelving and picking, and the average of 27€/hour charging value, the annual financial benefit is nearly 3400€ in labour costs. This may seem a small amount, but when only by concentrating on fast moving products nearest to the handling area and changes made within a range of less than 100 meters, this is still a notable saving. On a larger scale, this kind of model or layout saves labour time to more efficient time usage, decreases the vehicle strain and increases the volume of larger goods handling.

5.10 Results

The overall outcome from the project is the composition of several benefits, which in the end was formed as an improved operational environment. The main point was to have the goods handling operations easier in the limited range of products and in a specific location, this resulted in the form of the new layout. This layout was based on the Logmaster reports and made according to the flow rates calculated based on those reports. On the following page are the results, summarized in three specific aspect details, that the new layout will provide.

Operational aspect

- Product flow is now more systematic
- Clearly marked areas are easier to recognize and it is easier to identify locations for specific items
- Layout saves labour time to more efficient time usage and increases goods handling volumes

Physical aspect

- Driving distances are shorter and routes avoid bad floor conditions
- Less lifting is required since the products with a high flowthrough rate are located on the ground or second level
- Decreases the vehicle strain
- Increased shelf availability

Financial aspect

- From 14 minutes' daily saving the annual financial saving in working hours is around 3400€/year
- On a larger scale this model may result in more significant money savings

FIGURE 17. Summarized results from the case

5.11 Future Development

After the layout design was finished, the next step was to take it into use. At first the layout plan and to Logmaster combined table was intended to take into action just by having a list of all the categorized items for the receiving person. Based on that table both the receiver and forklift driver would know where each product should be placed. Now just before this thesis was finished, the company Logistikas acquired a new hand-held mobile system for the warehouse use (see Figure 18). With this gadget the warehouse personnel is able to control order invoices, monitor inventory levels and carry out picking and shelving operations. It uses a basic bar code reader to identify products from far distances but it has all the possible functions available with the manual use as well.

From the practical and system point of view, for each product an optimal shelf location is now shown individually based on the created Logmaster combined table and colour classification. As the forklift driver drives to an aisle where the optimized location is, the driver can put the incoming pallet to the slot available. Bar code reading now also decreases the manual writing when the shelving confirmation is only a push of a button and the handling information is recorded to the database.

At the beginning the hard phase was to identify the goods' movability or flowthrough rates during the defined timeline. This time these products had no forecasts provided, mostly because of the nature of the products. Only some of the items had regular times and batch sizes that were known before, but still this did not provide enough valuable data for the thesis problem purposes. Forecasts may be hard to produce depending on the end-product's nature (for example seasonal product as in other Logistikas facilities) but in this case the target market field was agricultural vehicles, for which it is more or less known how much they require different parts and when. As future potential as this kind of a layout resetting may be done for other Logistikas facilities with a different product range, forecasts can be valuable data in order to work efficiently in forthcoming development purposes.



FIGURE 18. HandHeld Mobile (HandHeld products, 2013)

6 CONCLUSIONS

In third-party logistics the key elements of operations from the customer point of view is flexibility and good communication between the business partners as well inside the facilities. The vendor is responsible for all the customer goods by means of managing orders, inventory and forwarding actions. Inside all these management fields, there is the factor of handling the goods physically with a forklift, picking a pallet and putting it in a convenient spot where it is easy to store and find. As the goods are now in a more systematic order they are easier to manage, as well as much faster. A more rapid response to large shipments and systematic order picking abilities lead to saving time and effort for other operations. This brings more flexibility to the warehouse personnel. From the shelving point of view, the colouring classification brings more flexibility to the whole warehouse, more open space for a new product range from the existing customer or even for a future customer contract. This layout is unique and it only works in the Säynätsalo facilities, but the principle that it is based on may be used in other facilities too. Each facility requires a background study on what kind of products are in focus. On theory basis, flexibility, agility, openness, transparency and good communication are factors that have vastly increased in customer demand in the past and that are also required in the future. The thesis project did not show dramatical improvements in the financial aspect for the company, but from operational point of view, an improvement that increases the flexibility and agility of the inventory management. This can be considered one of the means for having an effect on the customer relationship as a value, too.

This thesis has studied theories and reflected those theories on a real-life case, which all have a close relation to the above-mentioned requirements. From TPL reports it can also be seen that shippers or customers are willing to emphasize the innovations within their businesses and that is something they require from their outsourced business partners as well. Third-party logistics usually provides development implementations to existing systems, and that is something this thesis problem was focused on. The creation of an innovation needs a proper base to function on, this thesis has shown the theory behind third party logistics, an example of a research and development process, and therefore made that base a bit more stable and systematic.

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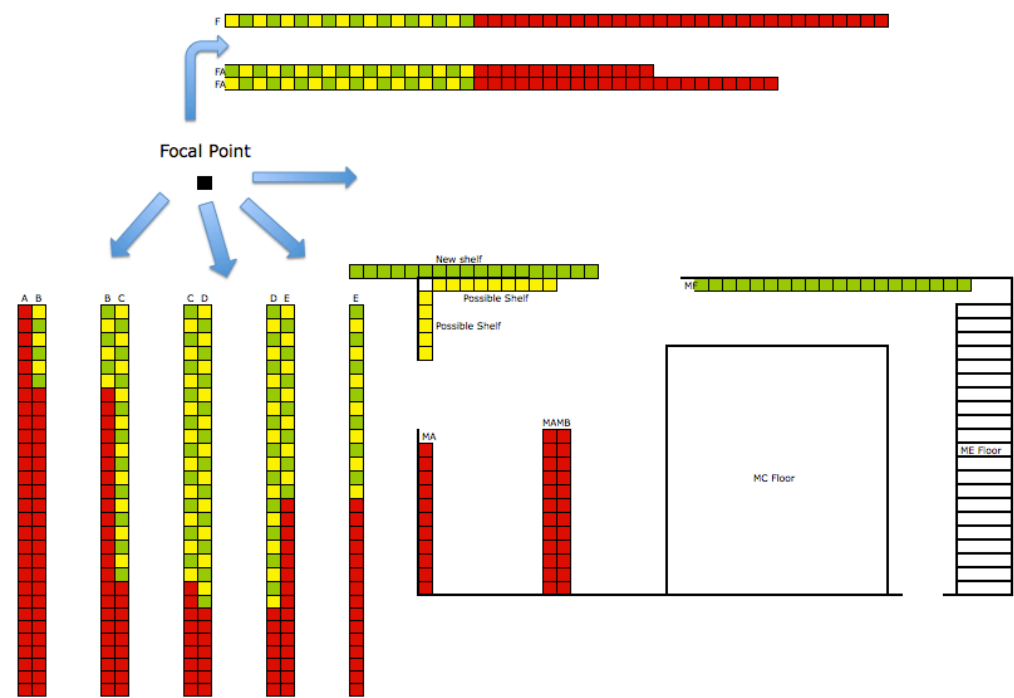
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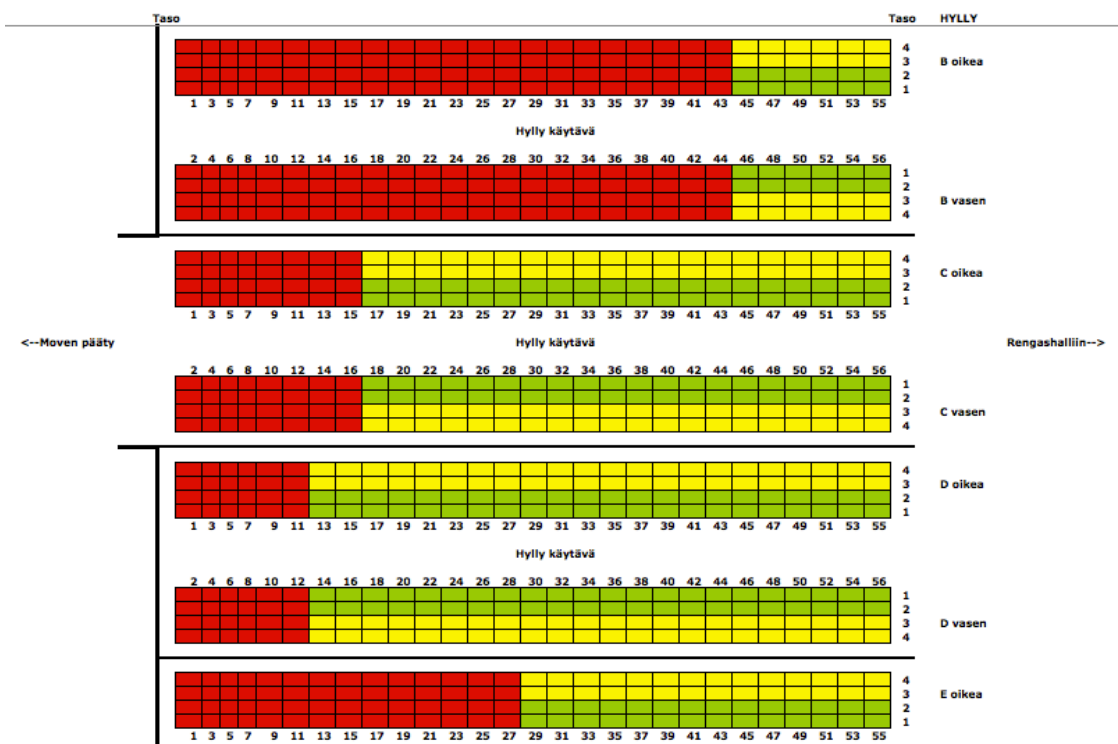
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APPENDICES



APPENDIX 1. New Layout top view



APPENDIX 2. New Layout level setting view, example clip from shelves B to E